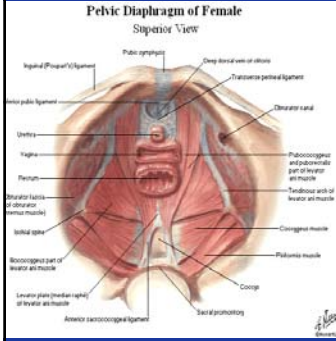




## Pelvic Floor

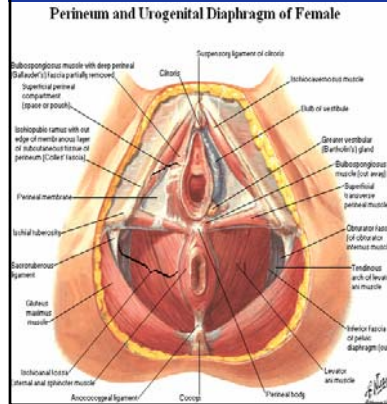


The **levator ani** forms the principle support for pelvic viscera.

**Puborectalis** fibres - situated immediately adjacent to and below the innermost component of the levator ani.

Associated with the fibres of the deep external anal sphincter. When contracted, the puborectalis forms the acute angle between the levator ani and external anal sphincter.

## Female Perineal body



Divided into 2 triangles.

**Urogenital (anterior)** – contains external genitalia in females, root of scrotum & penis in males.

**Anal (posterior)**

**Perineal body** lies within the ano-vaginal septum in females.

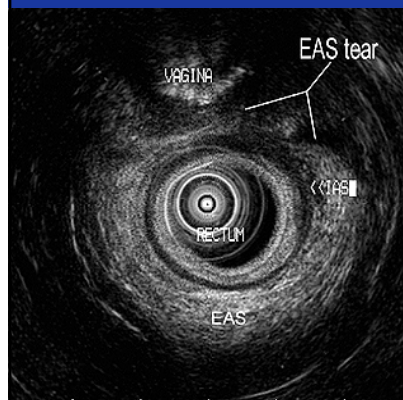
Anchors the anorectum & vagina.

Provides a physical barrier between the vagina and rectum, maintaining urinary & faecal continence

## Perineal Body

- Fibres from puborectalis, external sphincter, longitudinal muscle & internal sphincter fuse into the muscles of the anterior urogenital triangle – deep & superficial transverse perineii & bulbospongiosus muscles.
- An important structure – supports all the musculoligamentous components of the pelvis.
- Perineal body damage could predispose to anterior or posterior perineal prolapse of pelvic organs.
- Episiotomy** – incision in the perineal body at delivery. Midline incision associated with higher rate of 3<sup>rd</sup> degree injury.
- Perineal tears** – higher risk in primagravid patients when perineum is more rigid.
- 3<sup>rd</sup> degree tear – involves IAS & EAS.
- 4<sup>th</sup> degree tear – extends into rectal mucosa.

## Endo –Anal Ultrasound



Diagnosis of benign ano-rectal disease - sphincter defects, fistula.

Aids decision making in management of faecal incontinence.

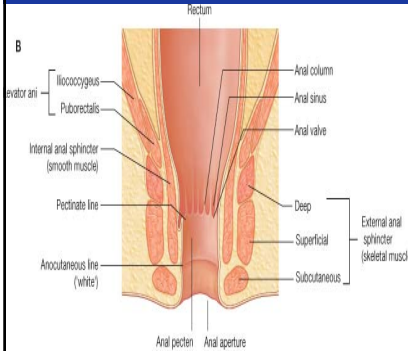
Anal cancer.

Minimally invasive.

Easy to perform.

Performed by colorectal surgeons in many centres.

## Anal Canal



- 2- 4 cm long.
- **Internal sphincter**, smooth circular muscle, continuation of circular rectal muscle. Involuntary smooth muscle. Extends to the dentate line
- **External sphincter**, striated muscle, forms a circular cuff around the internal sphincter. Extends from the puborectalis to the anal verge.

## Innervation of the Pelvic Floor

Sacral peripheral nerves are the major pelvic floor innervation. Denervation associated with muscular weakness & bladder & rectum functional problems. Also, reproductive and sexual activities. Important cause of pelvic floor dysfunction.

- **Lumbosacral plexus & small visceral nerves** – supply pelvic floor muscles from a superior aspect & pelvic viscera.  
**Subject to trauma from obstetric delivery and pelvic surgery**
- **Pudendal nerve** formed by lower division of lumbar sacral plexus. Provides muscular innervation to superficial muscles of pelvic floor from an inferior aspect.  
**Subject to stretch injury when pelvic floor descends.**

## Defaecation

Highly complex function integrating voluntary and involuntary mechanisms.

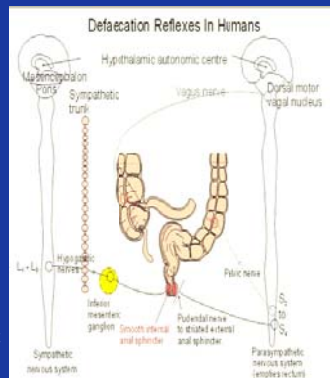
### Autonomic nervous system.

Parasympathetic, Sympathetic & Enteric.

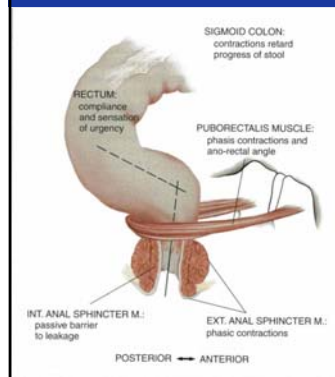
Functions involuntarily & controls activity of bladder, anorectal & other pelvic smooth muscles.

### Enteric nervous system.

Intestinal motility independent part of ANS.



## Defaecation



Rectal distension stimulates internal sphincter relaxation & sampling reflex.

Voluntary contraction of the external sphincter & levator ani muscles occurs if defaecation is deferred.

Levator ani & puborectalis muscles & external sphincter relax at appropriate time for defaecation.

Pelvic floor relaxation + squatting position straightens the ano-rectal angle.

Increase in abdominal pressure + colonic & rectal contractions allow expulsion of the faecal bolus.

## Constipation

- Common medical problem – approx.20% pop.
- Can be managed using simple treatments
- Many patients do not seek medical help & *suffer in silence*.
- Patients often self medicate & seek medical help to resolve complications.
- Consequences can be serious – impaction, obstruction, perforation, bleeding.
- Patients can develop megacolon or volvulus with resultant ischaemia

## What is Constipation?

- Difficult to define because regularity varies between individuals.
- Factors other than regularity must be considered – consistency of stool, passage, pressure, pain on defaecation, discomfort, distension, bloating, feeling of incomplete evacuation.

### Rome II Criteria for constipation

2 or more of the following for 12 weeks (not necessarily consecutive) in the preceding 12 months for 25% bowel movements.

- Lumpy or hard stools
- Straining during evacuation
- Sensation of incomplete evacuation
- Sensation of anorectal blockage
- Manual manoeuvres to aid defaecation
- Less than 3 bowel movements per week.

## Primary Causes of Constipation

| Behavioural                            | Painful Lesions         | Structural Problems                 |
|--|-------------------------|-------------------------------------|
| Low fibre & water in diet              | Anal fissures           | Tumour                              |
| Decreased physical activity            | Thrombosed haemorrhoids | Inflammatory or ischaemic stricture |
| Poor / inconvenient toilet facilities. | Mucosal prolapse        | Diverticular disease                |
| Voluntary suppression of defaecation.  | Ulcerative proctitis    | Inflammatory bowel disease          |
| Psychiatric disorder                   |                         | Endometriosis                       |
|  |                         | Volvulus                            |
|  |                         |                                     |

## Secondary Causes of Constipation

- **Metabolic & endocrine** – chronic renal failure, diabetic neuropathy, hypo & hyperthyroidism.
- **Neurological** – MS, Parkinson's, stroke, spinal cord injuries.
- **Systemic** – Lupus, scleroderma.
- **Functional** – slow transit, colonic inertia.
- **Drug related** including
  - Analgesics.
  - Antihistamines.
  - Anticonvulsants.
  - Diuretics.
  - Chemotherapy agents.
  - Anticholinergic agents..
  - Antihypertensive agents.
  - Metal ions & agents – antacids, iron & calcium supplements,

## Pelvic Floor Disorders

There are a number of disorders related to the pelvic floor, both functional and structural.

- Constipation.
- Obstructed defaecation.
- Faecal incontinence.
- Prolapse- rectum / vagina / bladder / small bowel

Difficulty with rectal evacuation is the main referral reason for proctography.

## Female Pelvic Floor Disorders

- Laxity of the pelvic support, caused by weakness, injury to the ligaments, connective tissue and muscles, can result in prolapse of uterus, vagina, rectum & bladder.

- Pelvic organs may protrude into the wall of the vagina or protrude all the way through to outside of the body.

### Causes

- Being pregnant & vaginal delivery + stretching of the pelvic support. Risk increases with each delivery. Nerve damage at delivery may lead to muscle weakness.
- Hysterectomy.
- Obesity
- Chronic coughing
- Age – musculature weakens.

## Symptoms of Pelvic Organ Prolapse

- Feeling of heaviness or pressure in the area of the vagina.
- Feeling that the uterus, bladder or rectum are falling out.
- **Enterocele** - back pain, incomplete evacuation.
- **Rectocele** - sense of constipation. Patient may have to digitate.
- **Cystocele, cystourethrocele** - Stress / urge incontinence.
- **Vaginal** – only post hysterectomy. Frequent need to urinate, difficult bowel movements. May cause kink in urethra & hide urinary incontinence.
- **Uterus** (Procidentia) – difficulty with bowel movements, urinary incontinence, pain on walking

## Radiological Grading of Prolapse

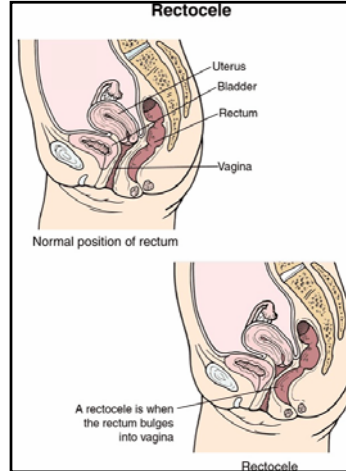
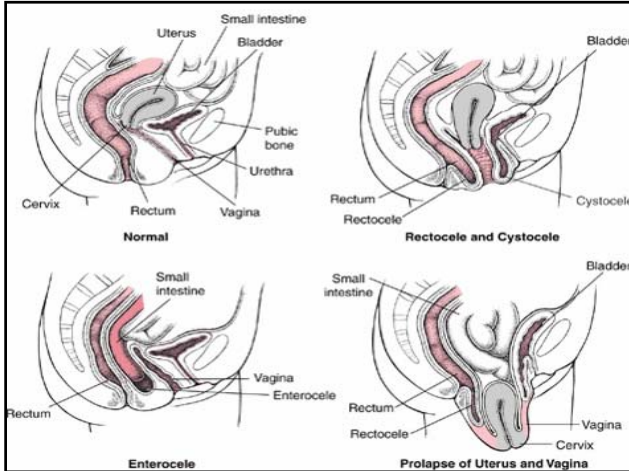
Radiologically referenced to the pubococcygeal line - inferior margin of pubo-symphysis to sacrococcygeal junction.

### Grade

Small up to 3cm from pubococcygeal line.

Moderate – 3-6 cm.

Large - > 6cm.

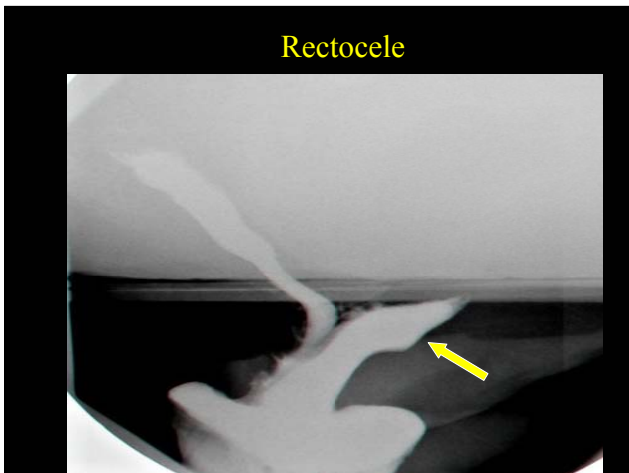


**Rectocele**

Can be described as a bulge in the anterior wall of the rectum, as the patient strains downwards. Posterior herniations can also occur.

Occurs as a result of inadequate support or laxity of the endopelvic fascia above the anal canal.

Considered to be secondary to obstetric trauma or repeated straining due to a pre-existing disorder of defaecation or chronic coughing.



**Grading of Rectoceles**

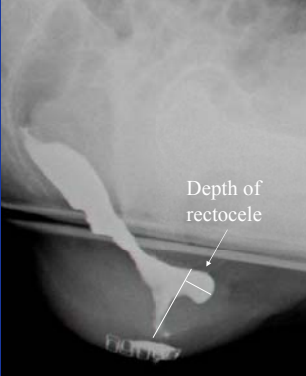
- **Small** - less than 2cm.
- **Moderate** – 2 - 4 cm.
- **Large** – over 4 cm.

Is barium trapping present or not post defaecation.

Asymptomatic rectoceles are usually small and do not retain barium.

### Rectocele

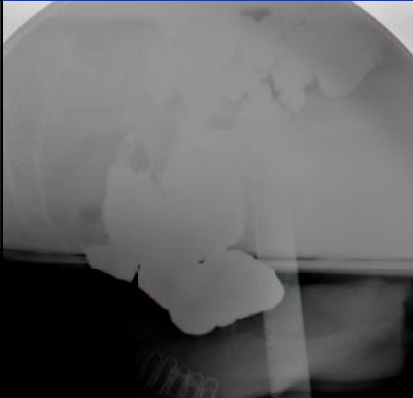
- Common symptoms – feeling of incomplete evacuation and / or discomfort after evacuation.
- Symptoms may be relieved by applying pressure to the vagina or perineum to facilitate defaecation (digitate).
- Symptomatic rectoceles are usually large and demonstrate barium trapping.
- Frequently associated with intussusceptions or prolapse.



### Enterocoele

- Develops when the small bowel and peritoneum bulge downwards into the recto-vaginal septum and / or into the vagina.  
**Opacification of small bowel and vagina required for definitive diagnosis.**
- Results from weakening of connective tissue & ligaments supporting the uterus.
- Common after hysterectomy.
- Often does not cause symptoms.
- Women can have a sense of fullness / feel pressure / pain in the pelvis.
- Back pain may also be a symptom.

### Enterocoele

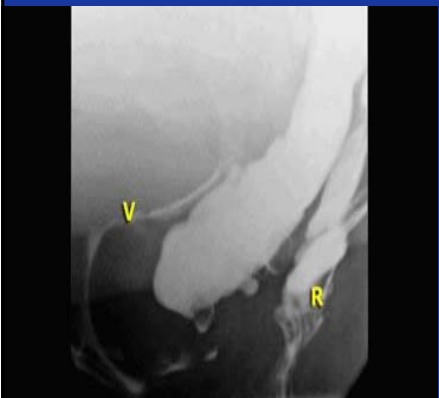


History of dragging feeling, persistent mucus & incomplete evacuation.

**Physical examination -**  
Perineal descent on PR. ? prolapse.

Post toilet image showing further descent of enterocoele.

### Sigmoidocele



Less common than enterocoele.

Prolapse of redundant sigmoid loop into the Pouch of Douglas.

## Investigations

Wide range of tests used to determine the aetiology of the disorder & to direct management of the patient.

- **Full and accurate history** – incl. bowel patterns, sexual abuse, medications.
- **Physical examination** – abdo & pelvis, sphincter tone, perineal inspection.
- **Anal rectal physiology tests** – manometry – functional info about anal resting & squeeze tone., rectal sensation.

## Investigations

- **Colonic transit marker study** – ingested radio-opaque markers. Normal transit 72 hours.  
At 120 hrs – > 80% markers remaining – slow transit.  
Accumulation of markers in sigmoid & rectum  
? anismus > proctogram.
- **Barium enema / colonoscopy** – anatomy / structural abnormality
- **Evacuating proctography** – Fluoroscopy / MRI.
- **Endo anal ultrasound** – sphincter defects.

## Investigations

### *Pre surgery evaluation*

- Anal sphincter defects.
- Rectal prolapse.

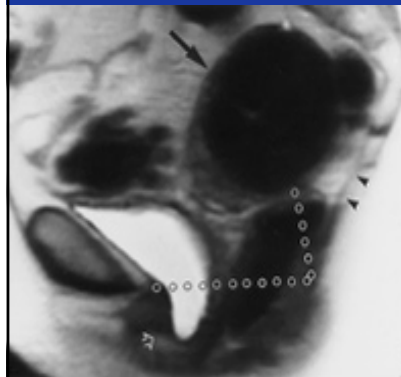
### *To help delineate difficult anatomy prior to surgery*

- Recurrent anal fistulae
- Recto-vaginal fistulae

### *Whether a non-surgical approach or biofeedback is appropriate*

- Non relaxing puborectalis.
- Incontinence.

## MRI Dynamic Evacuating Proctography



Exquisite images of the pelvic floor structures without radiation.

Lack of open magnets. Patients examined supine.

Good demonstration of prolapse.

Not for functional abnormality  
i.e anismus.



## Evacuating Proctography

- A rapid & simple technique that dynamically records voluntary rectal evacuation radiographically.
- Provides information of anorectal structure and function. Rectocele, enterocele, internal rectal intussusception.  
  
Anismus - Paradoxical contraction of the puborectalis that leads to obstructed defaecation.
- Uses radiation – Often young female patients. Difficulty with exposures due to difference in densities of the pelvic floor.
- Invasive – patient embarrassment.

## Evacuating Proctography Imaging

- C-arm Siemens Artis MP.
- Video + fluoro (Store fluoro) 7.5 pps.
- If patient is large – consider DSI at 1 frame per sec.
- Control DSI – at rest. Patient LT lateral
- Store fluoro of evacuating phase.
- On occasion – DSI post evacuation, if mucosal prolapse or intussusception present or suspected.

## Procedure

- Suppositories morning of test (3 hours before).
- Females – 3/4 hr before to drink 500ml dilute barium to opacify small bowel. Empty bladder.
- **Have everything ready!!**
- 120 ml E-Z-EM Paste in bladder syringes.
- Opacify vagina - sterile Gel + Niopam 370 & bladder syringe + paediatric enema tip or at least 12fr foley – cut & shorten.
- Patient Lt lateral – contrast in vagina (folded gauze in introitus) then contrast in rectum.
- Taped paper clip (5) markers - taped along anal verge. Gauge perineal descent.

## Procedure

- Patients booked at end of morning list.
- Gives me time to talk to patient without interruption. To discuss procedure & re-assure. Discuss symptoms fully. Case notes to be available.
- Minimum staff levels. Difficult if staff training. Ask patient if ok.
- Patients often want & need the opportunity to talk about their symptoms & problems. Can be distressing for patient to talk about their condition.
- Patients often “open out” – some have talked about past sexual abuse. Aspects of history not revealed to referring consultant.

## Equipment



- C-arm remote control digital unit. + filters.
- Commode chair + plastic insert that fits into commode opening.
- Wedge shaped filters taped to radiolucent plastic bed pan shaped topper.

## Equipment



- Covered with plastic bag & pad for cleanliness & patient comfort.
- Pad placed under patient's feet if necessary.
- Mobile screen placed across front of patient for privacy.

## Technique

### Speed of the essence + ensuring patient privacy.

- Centering important - allow for descent of pelvic floor.

### Pre - evacuation

- Lt lateral position + sitting erect. Asked to relax pelvic floor. May be squeezing in a bid not to empty rectum or with embarrassment.

### Evacuation

- Patient asked to empty their rectum as quickly as possible. May be necessary for them to carry out their usual manoeuvres.

## Post Evacuating Phase

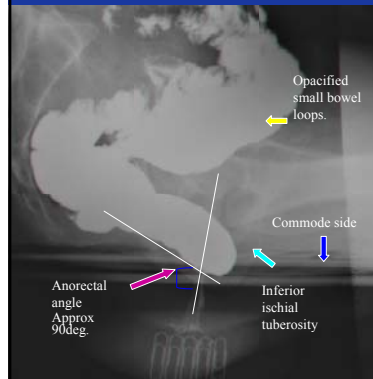
*When evacuation is complete or it is clear that little or no evacuation is likely.* Should be within 30 secs.

- Anal canal closes.
- ARA ascends to its pre-evacuation resting position & configuration.
- The rectum is empty or nearly so.
- ? **Intussusception** – image patient in AP position on straining.
- ? **Enterocoele** – often only become evident at end of evacuation. Post toilet image in Lt lateral position. Evacuation should be as complete as possible. Descent of enterocoele may be prevented by unemptied rectum or rectocoele

## Findings

- Patient seated left lateral position provides the most information about anorectal configuration & pelvic floor position. Easiest to assess degree of rectal emptying.
- Anorectal junction defines level of posterior pelvic floor. Inferior surface of ischial tuberosities used, as bony landmarks may be difficult to identify. ARA should be at or just above this plane.
- Is anal canal tightly closed & no leakage of contrast at rest. If not -? Continence problem. ? Sphincter tone at PR.
- Degree of pelvic floor descent. Anal verge delineated with markers ( paper clips on tape) may help assessing descent of perineum.

## Pre – Evacuation Phase



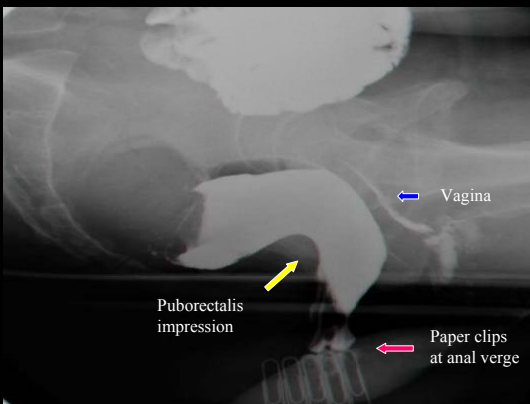
Anal canal should be closed at rest.

Position of the pelvic floor inferred by the inferior ischial tuberosity or the side of the commode.

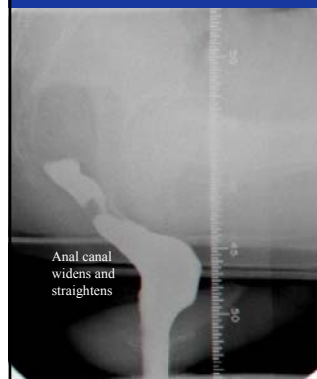
Pelvic floor descent of up to 3.5cm from this line is considered within normal limits.

Puborectalis muscle impression is often seen at rest.

## Pelvic Floor At Rest



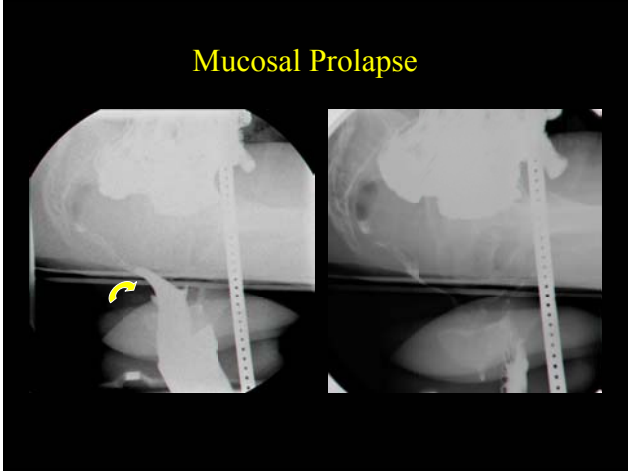
## Evacuating Phase



### 5 elements to consider

- ARA – ? more obtuse. Obliteration of puborectalis impression.
- Anorectal junction level relative to ischial tuberosities.
- Anal canal - widens & straightens on evacuation.
- Subjective assessment of the efficiency & degree of rectal emptying. Empty promptly within 30 secs.
- ? Degree of rectal mucosal prolapse & any rectocele or enterocele formation.

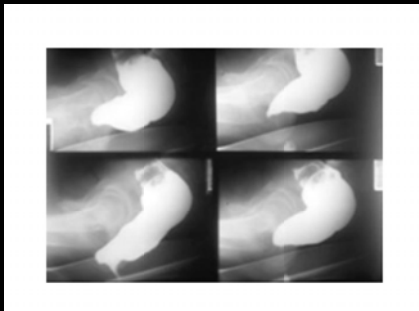
## Mucosal Prolapse



## Anismus

- **Also** -Spastic pelvic floor syndrome / outlet inertia / paradoxical sphincter response / rectoanal dyssynergia / non relaxing puborectalis muscle.
- Results from sustained contraction of pelvic floor musculature during attempted defaecation.
- Levator ani (incl. puborectalis) fail to relax – rectal evacuation is impaired.
- Majority of patients are unable to evacuate more than 2/3rds of contrast within 30 secs.
- Anismus may be associated with rectocele, rectal intussusception, solitary rectal ulcer, slow transit constipation. Some of these disorders may be secondary to chronic straining of anismus.

## Anismus



### Normal

Puborectalis contracted at rest – sharp ARA.

On defaecation – puborectalis should relax and aRA become more obtuse.

Inadequate rectal emptying + sharp ARA despite sustained propulsive effort indicating anismus

## Biofeedback

- Anismus - considered a behavioural disorder involving inappropriate contraction of the voluntary pelvic muscles.
- Biofeedback considered the therapy of choice.
- Involves re-educating external sphincter muscles to relax rather than contract.
- Techniques used include anorectal manometry.
- Monitoring of the EAS pressure during attempted expulsion of the biofeedback instrument.
- Patient watches recording of sphincter pressure responses & is instructed how to modify inappropriate responses.
- Surgery – last resort for patients with outlet inertia.

## Radiological Report

### History

Findings – At rest , Evacuating phase, post evacuation.

### Conclusion.

- Rectal configuration at rest  
Position of pelvic floor – whether normal or there is abnormal descent + scale of descent.  
Evidence of marked puborectalis impression.
- Degree & rapidity of evacuation.
- Presence and grading of any structural abnormalities.
- Comment on any strategies that the patient employs to empty the rectum – e.g rocking the pelvis, digitates.

## Typical Report

**History:** Obstructed defaecation. PR bleed. Clinically due to mucosal prolapse.

### Findings:

**At Rest** – normal position of pelvic floor at rest. Prominent puborectalis impression.

**Evacuating phase:** Normal descent of pelvic floor. Despite sustained propulsive effort the puborectalis impression remained and the anal canal did not open. The rectum was partially emptied when the patient employed her normal strategy of lifting and rocking her pelvis. She was then sent to the toilet to attempt further clearance of barium from the rectum.

**Post evacuation phase:** The rectum had completely emptied of barium and the pelvic floor had returned to its normal position at rest.

**Conclusion:** Constant puborectalis impression at rest and during defaecation, with only partial clearance of the rectum after 30 secs. No evidence of mucosal prolapse. **The appearances are highly suggestive of anismus.**

## Investigations & Patient Management

- Combining patient history, physical examination & radiological findings should be the aim of a pelvic floor service, as problems can be multifactorial.
- Broad range of normal.
- Traditionally pelvic floor compartmentalised in many hospitals.

Anterior compartment - bladder & urethra –urologist.

Middle compartment – uterus & vagina – gynecologist

Posterior compartment – small & large bowel – colorectal surgeon.

## Patient Management

- Clinical examination may not reveal or may underestimate structural problems.
- Imaging may not correlate with the patients symptoms.
- Treatment of one compartment affects the structure & function of the others.
- Should strive for agreed pathways. Working together in a multidisciplinary team.
- MDT for pelvic floor dysfunction.
- Working with colorectal surgeon to develop a pelvic floor group across different Trusts.

## Some of the experts in the Field

- C. I. Bartram.
- J.O.L. DeLancey
- S.Halligan.
- F.M.Kelvin
- M. Marshall.
- D.D.T.Maglinte.
- P J. Shorvan.
- A.H. Sultan.

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